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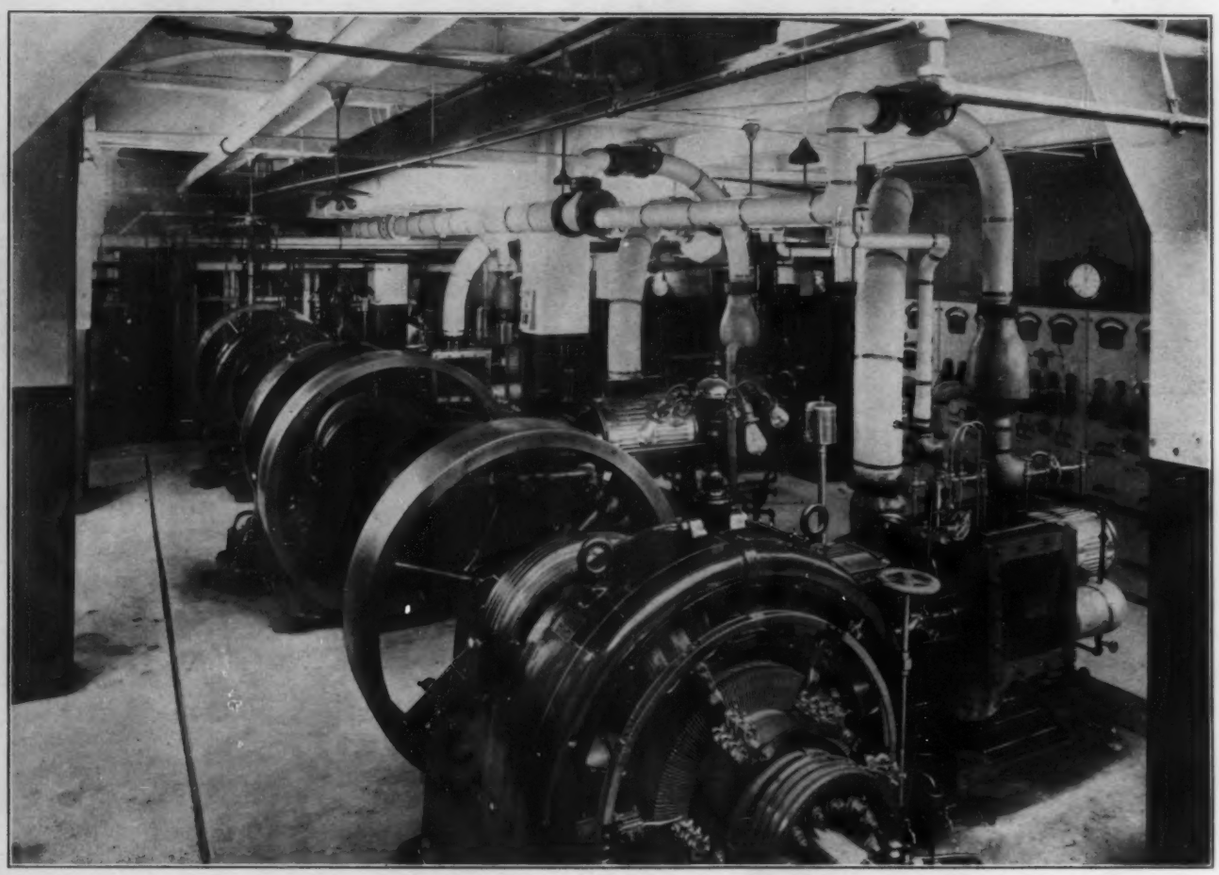
VOLUME XXII. SAN FRANCISCO, MARCH 27, 1909 NUMBER 13

ISOLATED PLANT OF THE ALASKA COMMERCIAL BUILDING.

BY J. B. WILLIAMS.

The isolated steam electric plant of the Alaska Commercial Building, San Francisco, is illustrative of the high-class equipment necessary to supply the varied needs of a modern office building, the best types of which have been erected in the recent reconstruction of San Francisco. This plant supplies electric power for the elevator and lighting service of this and several adjacent buildings. Direct current is supplied by three three-wire generators. Steam is also furnished for heating, for the operation of the high-pressure fire fighting and water supply system and vacuum cleaning.

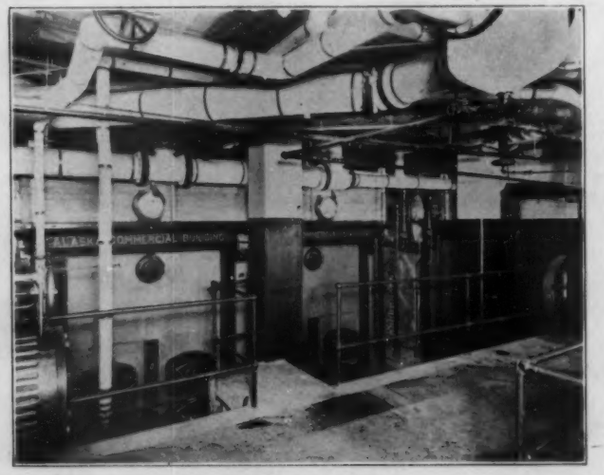


Engine and Dynamo Room, Alaska Commercial Building.

The steam boilers are of the water tube type, oil-fired from the rear, or what is known as back shot burner, with especially designed furnace for the purpose. The plant consists of three boilers arranged in a battery of two, and one single, rated at 150 h. p., each carrying a steam pressure of 140 pounds per square inch. They are equipped with two safety valves and two blow-off valves, and also automatic stop and check valves. The front and side walls are faced with a gray pressed brick such as are used on the face of the building, giving a very clean and neat appearance. The feed pumps are in duplicate and are of the steam-driven duplex type. The house pump used for pumping water for house service is also in duplicate and of same pattern with automatic control to maintain uniform water level in the tanks on the fourteenth story.

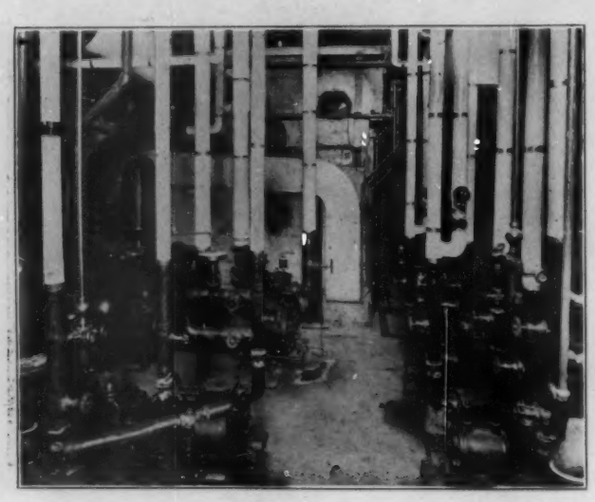
The vacuum pumps for the heating systems are also in duplicate and of the simplex type, each pump capable of taking care

of 50,000 feet of radiation. The fire pump is of special design and built according to specifications of the Board of Fire Underwriters. It is of 500 gallon per minute capacity at a pressure of 150 to 250 pounds per inch suction and is connected to a 30,000-gallon reservoir in the basement, into which all the tanks in the tank room can also be emptied, giving a total water supply available instantly of 60,000 gallons, independent of outside source.



Boilers of Alaska Commercial Plant.

The discharge of the fire pump is connected to the down pipe from the tanks on the fourteenth story, into which is inserted, close to the tank, a check valve, thus permitting the hose reel to be under pressure from the tanks at all times. When in case of fire the pump is put in service, the pressure would close check valve and subject the hose reels to the pressure and supply from the pumps. All the fire lines throughout the building are painted red, and red lights are kept constantly burning at the throttle valve of the fire pump, so that any one not familiar with the place could get the pump into service. All other valves being open and steam being at the throttle at all times, this can be accomplished very quickly by simply opening the throttle valve. In



Pump Room.

addition, the watchman rings a box located on each floor and basement, fifteen minutes being allowed. Should he miss a box, from being disabled or from any cause whatever, a man is sent from the office to look him up, making the building doubly secure, either from the outside or inside.

All other auxiliaries are electrically driven with chain drive, except the vacuum sweeping plant, which is steam-driven. The engine-room floor is four feet above the boiler-room floor.

The engine foundations are built of reinforced concrete in one block 10 by 40 by 20 feet, entirely insulated from the main structure, eliminating possibility of vibration from this source. All wiring from the generators to the switchboard is conduited and cemented under the floors.

The engines are three in number, tandem compound, running at speed of 250 r. p. m., directly connected to three-wire direct-current generators, two being 100 k. w. and one 75 k. w. capacity. Steam is furnished the engines through an eight-inch main suspended to the ceiling with non-vibrating hanger and taken from the main through a five-inch pipe, which is made into the sweep necessary to connect to the engine, presenting a very neat and symmetrical appearance.

All high-pressure drips from separators and steam mains are collected and taken to the high-pressure receiver and pumped direct through feed line to the boilers. Low drips are taken to a like receiver and discharged through the grease extractor and filter to the feed water heater, which is an open heater. All returns from the heating systems are delivered by vacuum pump to the feed water heater, making it necessary to use a very small quantity of make-up water.

The building consists of a steel frame with concrete fire proofing, faced with concrete curtain walls and floors. All indoor partitions are of steel studding and expanded metal lath covered

Entrance to Alaska Commercial Building.

with hard wall plaster. All doors and frames, windows, transoms—in fact, everything that is not of steel, iron or concrete—is covered with metal especially prepared to resist fire. Even the glass on all the frames, doors, rear and light well windows is ornamental wire glass. It is fourteen stories in height, the fourteenth story containing the tanks and overhead work of the elevators. The floors are of concrete, covered with battleship linoleum. The corridor floors are of marble tile, the wainscoting of highly polished and selected marble, which reaches to the top of the doors. All windows in the building excepting those in the light court are equipped with a sash hanger which will permit these windows not only to be raised in the ordinary way, but also allow them to be opened like a door, thus eliminating the dangerous necessity of outside cleaning. Each floor has ten offices, approximately 5000 feet, with soundproof as well as fireproof partitions. Two vaults are at the end of each corridor on every floor. Each office is entitled to a compartment which has a combination lock. These vaults are designed so as to remain intact through the worst vibration or conflagration.

Each office is supplied with hot and cold water, and filtered, sterilized and cooled water for drinking purposes.

Heating is accomplished by the vacuum system. All steam and return risers exposed in rooms are covered with regulation insulated cover. The radiators are of the wall type, being off

the floor, and anchored to the walls in a substantial manner, taking up a minimum of space, directly under the windows. Connections outside are provided with a duct with a regulator in order that fresh air may be drawn in, thus keeping the office ventilated without causing draughts.

All the plumbing is carried in shafts from top to the bottom of the building, and all water and waste branches, being but a few inches long, make everything accessible and easy of repair and dispense with the disagreeable feature of having the water pipes

Alaska Commercial Building, San Francisco.

buried in the walls. Heavy galvanized iron pipe and Durham fittings are used throughout.

Hot water is furnished by means of a complete circulating system through hot water heaters situated in the basement. The temperature is kept uniform by a thermostatic valve which is peculiar to the Tobey heater. Exhaust steam is used to heat the water. City water is furnished in cabinets, being first filtered through sand and gravel, then pumped to the house tank in the tank room on the fourteenth story, whence the various pumping stacks are fed. Water for sanitary purposes is obtained from an artesian well 200 feet deep. The water is delivered to the tank in the tank room by means of compressed air, which is pumped into the well by a horizontal 6x9 motor-driven compressor with chain drive. The efficiency of this installation compares very favorably with the direct steam-driven pump. A great advantage and convenience is apparent in that there are no moving parts in the well, dispensing with the necessity of pulling out the pump or bucket. All repairs are on the surface and easily looked after.

The discharge of the well is fitted with a by-pass, so that water can be delivered to a 30,000-gallon reservoir in the basement, which is always kept full for fire protection.

Sterilized drinking water is supplied by a system of forced circulation. Cold water is pumped through the building, the main being in the basement. Risers taken at the various shafts and collected in the main in the attic and carried to an expansion tank in the tankroom and from there returning by gravity to the cooling tank in the basement. As all branches are but a few inches long, there is no opportunity for any dead water to accumulate, making a minimum of waste and always insuring a good cool drink of water. The average temperature of the water in the offices is 42° Fahrenheit, 36° in the cooling tank and 45° Fahrenheit returning to the cooling tank, losing about 9° in transit. All cold water piping is covered with felt covering to prevent sweating as well as loss by radiation.

The cooling is accomplished by what is known as the compression system, liquid ammonia being directly expanded in coils which are submerged in the water to be cooled. This is known as direct expansion. The refrigerating plant consists of a motor-driven compressor with chain drive which has a capacity of three tons of ice per twenty-four hours.

Elevator service is furnished by three cars of traction type running at a speed of 550 feet per minute, 2750 pounds capacity. By test which was carefully conducted it was discovered that these elevators travel 2500 miles per month at a cost of 27 cents per mile, including repairs, interest, depreciation, taxes, insurance and operators' wages.

The building, which cost $850,000, was designed by Meyers & Ward and constructed by George A. Fuller Company for the Sloss and Gerstle interests of the Alaska Commercial Company.

TESTS IN ROCKY MOUNTAIN COALS.

Investigations conducted at the fuel-testing plant of the United States Geological Survey at Denver, Colo., during the fiscal year 1908, into the washing and coking of the coals of the Rocky Mountain region have just been reported upon by the survey. In the time that the plant has been in operation, results have been achieved which will prove of the greatest importance to the entire western part of the country.

Of thirty-seven coals tested from the Rocky Mountain region, all but three produced good coke under proper treatment, though a number of them had been considered non-coking. A bulletin detailing the tests conducted at the Denver plant by A. W. Belden, G. R. Delamater and J. W. Groves has just been issued by the Technologic Branch of the Geological Survey.

"The tests detailed in this bulletin are a continuation of the work started several years ago in St. Louis at the Government fuel testing plant there. On the completion of the work at St. Louis the writer made a trip through the Rocky Mountain region for the purpose of selecting a site for washing and coking tests on coals of the western half of the United States, with the hope of getting into closer touch with the fields from which little or no coal had been received at the testing plant in St. Louis.

"The different points available were visited, and after investigation, Denver, Colo., was selected as the most suitable on account of its central location and railroad facilities."

LIGHTING WITH METALLIC FILAMENT LAMPS.

Discussion by members of the San Francisco Section, American Institute of Electrical Engineers of paper read by Mr. E. L. Sherwood and published in the Journal of Electricity, Power and Gas, of March 20, 1909. The following took part in the discussion:

A. H. Babcock, Electrical Engineer Southern Pacific Company, Chairman.

C. L. Cory, Professor of Electrical Engineering, University of California.

S. G. McMeen, Chief Engineer Empire Construction Company, San Francisco.

G. E. C. Holberton, Pacific Gas & Electric Company.

H. Y. Hall Jr., Assistant Electrical Engineer, Southern Pacific Company.

R. M. Alword, Sales Engineer General Electric Company, San Francisco.

S. J. Lisberger, Electrical Engineer, California Gas & Electric Corporation.

S. B. Charters, Leland Stanford Jr. University.

C. J. Wilson,

The Chairman: Gentlemen, I am sure we have all been very interested in this paper. The only regret is that advance copies were not sent out, so that they could be thoroughly digested and an adequate discussion brought out. Those curves are full of meat, and I think would bear a pretty careful analysis. There is a certain conservatism to be met in the introduction of all new devices and particularly so in the incandescent lamp business. The lighting of our homes and office buildings—the places that we live in and the places we work in—according to my notion, has been extremely bad. I have been very much interested in reading the papers and the discussions of the Illuminating Engineering Society as showing the results which can be reached when men with brains begin to use those brains in a certain definite direction. Their efforts are directed in the first place to the right use of the light in regard to its effect upon the optic nerves, to take care that we do not have reflections, and that all light comes in the proper direction. In the second place, they are directing their efforts toward economy in cost per year in operating the lamps. Both of those are very important things. The architects of today seem to hang back and cling to the old methods that were used when we had kerosene lamps, and afterwards, when we had gas. I am expecting that the scientific men who are working along these lines will produce some important revolutions. Papers of this kind are valuable to us who are not accustomed to dealing with these things in a technical manner. We have no formal discussion, because those who were to take part have been held up by the washouts and have not been able to get through in time. I will ask Professor Cory if he will open the discussion by some appropriate remarks.

C. L. Cory: There was one important point touched upon in the paper this evening, regarding the transformation of energy in a lamp and its use for the production of light or illumination. The lamp which is used for conversion of a small per cent of the energy of water power into light is really at the extreme, or at the top of the pyramid. On the other hand, if we consider that our electrical energy is coming from fuel, the device for converting the heat energy or energy of the furnace—perhaps the steam engine, or turbine—is at the other extreme. Therefore, from the standpoint of possible economy the development of an efficient light—that is, an efficient device for converting the electrical energy into light be given the most serious consideration by electrical engineers. That is one point which is very apparent.

Regarding the metal lamps, there is something which has followed right along in the development of light, and that is that high efficiency of illumination is inherently connected with high temperature. One reason why we have such a high efficiency in the arc lamp is because of the excessive high temperature of the electric arc. On the other hand, in the incandescent lamp the temperature is much less, and also the efficiency.

One thing that I noticed in our rather hasty view of the slides was the difference in efficiency between the small and the large tungsten lamps. As you of course know, the successful smaller lamps have come after the development of the larger lamp. There can be no question as to the very large application of the incandescent lamp even in the future. Nevertheless, it is striking when you go into a building where there are carbon incandescent lamps and tungsten lamps side by side, to notice the difference in the color of the light. That, of course, is due to the difference in the temperature of the filament.

From the standpoint of the power company or the company furnishing the light—rather, furnishing electricity, because that is what it amounts to—there is a problem involved which is of some considerable consequence, because there is a tendency right along to increase the voltage of our lamps from the old fifty-volt type to one hundred and ten and two hundred and twenty volt types of today, and now we come seemingly to a step backwards in the voltage supplied at the base of the filaments.

There is one very fortunate thing about the introduction of the tungsten lamp at this time. It is not like sudden changes in other fields of electrical engineering. If you decide, for instance, on some large single phase railway system that a certain frequency is to be used, it is a very expensive proposition to change the frequency; it will be found to cost a great deal to change all the machinery connected with that installation. On the other hand, it is not necessarily expensive to give the tungsten lamp a very complete trial. In this connection I think of one problem that has been occupying Mr. Vincent and myself for some little time: It is the choice of the kind of lamp, voltage of supply, etc., which is proper to put into a building containing the equivalent of about five thousand 16-candlepower carbon lamps. The illumination here is to be that of a library. The general illumination is to be taken care of and at the same time the individual lights, such as might be used in a library. The two systems which might be considered would be the 220-volt, 16-candlepower carbon lamp throughout, varying the size of the lamps and the number of lamps in a cluster, and all that sort of thing, which would be most desirable not only regarding the number of lights, but the kind of illumination—a very different kind of illumination in the large reading room than in a small room, where but few individuals need the light at one time.

I think electrical men have noted that our gas friends have advanced, perhaps up to within the time of the metal lamps, a little more rapidly than the electrical engineers, in new systems of lighting, especially in the very efficient methods of making gas burners for special purposes, and in the color of light. Five thousand lights is not a very large number, and yet it is an instance worthy of consideration in that while the number of lights will be very greatly reduced for a given amount of illumination with the tungsten lamps, and also the number of outlets and the size of control boards, cabinets, and so on, yet when we have gone through the thing pretty carefully we find there is a very material saving in the actual cost of installing the necessary wiring, if we use the tungsten lamps instead of the carbon incandescent lamps. I do not know if it will be sufficient to meet the difference in first cost of the lamps, but there will be a very large saving in using the 110-volt tungstens instead of 220-volt carbon lamps.

There may not be so much saving in the wiring, but in the general arrangement and the number of outlets required to conform with the requirements of the underwriters. Again, even when we come to the final adoption of the tungsten lamp, it is worth one's while to consider the size of thee tungsten lamps you are going to use in each case. As far as the carbon incandescent lamps are concerned, there has been a wonderful development in clusters and different kinds of globes, producing more uniform distribution, and I think even after we have come to the adoption of the tungsten lamp, or any of the metal lamps, we have got then to begin to investigate which is the best size to use for certain conditions. Naturally, for residences there is perhaps nothing that would be more acceptable than the smallest tungsten lamp we can get; I think it is known as the No. ½, or 20-candlepower, and that is the lamp which we would likely substitute for our 16-candlepower carbon lamp.

One other thing which I want to say, and that is that you find some skepticism in the ordinary users of light toward the tungsten lamp. I was surprised the other day in sitting at table with a half a dozen men, who should know better, to hear them declare that in fact there was no saving in meter bills using metal filament lamps. When you tell them that carbon lamps that cost 20 cents should be replaced by a tungsten lamp the first cost of which is five to six times as great, they begin to think that it is merely a scheme of the manufacturers to have them buy new lamps. As I say, there is a skepticism, which I dare say will be overcome in time, but to those of us who are giving serious attention to high efficiency, electricity to light, the saving of more than 50 per cent in the consumption of energy to produce a given candle power of light means a very great saving in the cost of operation. The saving will come in less cost of fuel, and in smaller generators, transmission lines, and transformers, and it is worth while giving special consideration to the change in type of lamps.

We are indebted, I am sure, to the author of the paper for these curves. I should like to have an opportunity to study them more carefully. There is a good deal of material collected here in definite form, and it would be very valuable for us who are interested in the use of the tantalum or tungsten lamp, to get some of the data shown by these curves, or even the tables themselves.

The Chairman: There was one point touched on very briefly, i. e., the cost of installation as compared with 16-candlepower carbon lamps and the tungsten or metal lamps, which seems to me would stand some amplification. The first cost of any installation is of some importance; but according to my notion the cost of operation of that installation is very vital. It is what we pay for year after year, and when a 10 per cent saving was spoken of in the cost of illumination there came to my mind an instance which has just gone through my office, where a building that contained a very large waiting room that was to be lit, according to the architect's plans, by 200-volt, 16-candlepower lamps. With electricity at a cost of three cents a killowatt hour, tungsten lamps made an annual saving of $3,800 in the lighting of that building. Strange to say, the report on that installation was criticised very severely on the ground that the tungsten lamp is an experiment, they did not think it would amount to much, and probably for a year or two we had better stick to the old carbon lamps. That is one of the conservatisms I alluded to.

Right here is coming a problem touched upon by Professor Cory, the problem of the distributing system. It is very much to the economy of the power company to use the 200-volt distribution, especially when they can supply a large service from one transformer. The cost of copper runs down very materially. They do not like very much to change to 100-volt, especially since it runs down the meter bill. On the other hand, the public has something to say in the long run, and that is a problem and condition that has to be met. It is not one to be shied at, dodged or evaded, and inasmuch as the organization whose guests we are tonight is foremost in the use of the 200-volt distribution service I would like very much to hear from someone connected with that institution on that subject. If Mr. Holberton is present I would like to hear from him.

George E. C. Holberton: I can only repeat what Mr. Babcock has said. We have got to go up against the public, and we propose to do it. The question of a 200-volt system is not altogether one of economy, pure and simple. There are other features aside from that, not only to the company but to the consumer. I assume that Mr. Babcock refers particularly to Oakland and Berkeley and that territory, because that is the territory where we are operating that way, and have now for about nine years. That started in the summer of 1900, and the problem then was this: At that time Oakland had a service, the most of which was 52 volts, with practically individual transformers. It was a bad service, poor regulation, and an uneconomical service to operate. Outside of the business district there was only the Jackson street district and Piedmont, where the wealthier class lived, that were using electric light. The houses in the vicinity of that district were old houses, which were not wired, and the growth of electric lighting supply would not come in that territory at all, because of the great expense of wiring the old houses. But we did have a problem to supply electric lights to new territory, where the buildings were much scattered. Taking the matter up at that time the company could not see its way clear to supply that territory by the method used down town, that is, 52 volts, nor even by changing to 100 volts. Then the question came up, that we wanted business and we wanted to accommodate those people in the growing residence territory, where the density was very light; that is to say, where the number of lamps used per block or lineal foot was small. But how was this to be done? We began then to figure on the question of using 200 volts, but even the ordinary 200 volts, 2-wire system, would not pay. Either the consumer would have to pay a heavy tax for extension of the line in order to supply him and have the company get any kind of a just return on the investment, or we would have to charge a rate which would be prohibitive. To overcome these difficulties we thought of the scheme of using 440 volts on the outside of a 3-wire network. That brought the cost of original extensions down so that we could make extensions without any cost to the consumer and supply practically all of the territory which was then building up and which has since become a very large territory. I do not know of any place where the business has spread as much as it has in Oakland and Berkeley. For about you might say eight years—seven or eight years—the Oakland Gas, Light and Heat Company did extend in that way without any charge to the consumer, and I feel perfectly safe in saying that if we had not that system, we could not have done it. Some time ago, I think as much as five years, I read a paper and gave some of the figures as to the relative cost of supplying the ordinary residence lighting by 100 volts, and by 200 volts, 3-wire, and by our 440-volt system. At that time we never dreamed of the advent of the tungsten lamp, and even then the carbon filament lamp, 220-volt, was nothing compared with what it is now. The objection raised then was that if the people took 220-volt they had to pay more for their lamps. That was met by the company's charging the same price for the 200-volt lamps as for the 100-volt lamps. That was done at a loss, but it was thought to be good policy. Then we had trouble with the wiring concerns. They claimed that the apparatus required by the Board of Fire Underwriters could not be purchased locally and that condition had to be met, which we did by establishing a sort of supply house in our office at Thirteenth and Clay streets, where we carried a stock of material which would be passed by the underwriters for that voltage. Now that the tungsten lamp has come, we have got to meet that. Just how it is to be done I am not prepared to say, although I have been assured by one of the largest manufacturers that they have now produced a 220-volt lamp that is satisfactory; and I do not think that we should make any change until it is determined whether that is going to be a fact or not. The lamps are not on the market and are not sold. The same company tells me that they can produce and will sell at the present time the tantalum for 220 volts. Now, if the light and efficiency of the tantalum lamp is approximately the same as the tungsten, I think that the problem can be solved in that way.

I do not know as there is anything else that you care to have discussed or to hear about. If there is anybody who would like to ask a question I will be pleased to answer.

I will say this, that naturally the largest demand for the tungsten lamps has been in the heavier installations, where the saving in dollars and cents is very much greater; and the heavy consumption naturally comes in the business district. In all places where we have the 220—440 volt system, as the consumption grows—that is, the density of consumption, the number of lights for installation—we have extended our 200-volt, 3-wire system, and we will keep on doing that. The 440-volt system was essentially a pioneering sort of system. It was a means by which we could reach everybody without any charge to the consumer.

The Chairman: The use of the 200-volt tungsten lamp combined with the 3-wire system would certainly be a very great step ahead, and we shall hope for the best on that.

George E. C. Holberton: In my remarks I referred to American production; I understand that in Europe and England the 220-volt tungsten lamp is already a commercial article in use.

The Chairman: I hope we shall find the domestic manufacturers equal to the foreigners.

George E. C. Holberton: The foreign lamp can be purchased now. I feel sure that the 220-volt tungsten will be produced, just as the tantalum is. I would like to say, too, because I learned that a number of people assumed that our company was one of a few who were in the 220-volt business, that we are not the pioneers in this. I think that Providence, R. I., is the first company to use it to any great extent. They have had for about eleven years a system of distribution at 500 volts, 250 volts between the neutral and the outside. That is an ideal system in other ways. A great many companies, through originally the introduction of the 500-volt trolley roads, have begun to supply 500-volt meters. That in the first instance is taken from the trolley. That is objectionable from a good many standpoints, particularly the insurance. But they have the service installed and they went to the 500-volt metallic service just as we did in Oakland. There are other 3-wire, 440 or greater voltage installations in Dallas, Texas, I recall as one; Richmond, Va., is another; St. Louis, and then there are smaller installations, to the number probably of 75 or 100 that I have looked up, just to see how common it was—that is, in the United States. In Europe and England it is very common, and I believe that the very fact that the saving to the company is so great in that form of distribution, and the ability of the company to reach a so much greater area at the same price for current, will induce the manufacturer to endeavor to meet that condition in his lamp. I do not recall the exact figures, but the production of 220-volt lamps has increased enormously in proportion to the total production.

The Chairman: During the reading of the paper, when the slides of the different parts of the lamp were on the wall, a little ancient history in the lamp manufacturing art came to my recollection, and inasmuch as the man who was responsible for the invention is not at all known in connection with it, and for the reason that the invention is so generally used, I would like to take your time for a few minutes and tell you of the invention of the Stereopticon Lamp. About ten or eleven years ago Professor Burkhalter, of the Chabot University, asked me if it was not possible to get an incandescent lamp that would give him a mere point of light so that for stereopticon work he could be independent of the arc light, which he could not get in his lecture room, and use an incandescent lamp, which he could get. His idea was beautifully simple. If he could get a point of light and put it in the focus of the condenser he could secure even illumination without any shadows. The ordinary lamp that we used then cast shadows from one turn of the filament over the other, and it interfered with some of his stereopticon pictures. He wanted a disc of light as small as possible. A small, flat coil in the shape of a disc or a cone-shaped filament was what he had in mind. I then was in the local office of the General Electric Company, and immediately wrote the lamp factory and sent on sketches of a number of his ideas. There was a most astonishing lack of comprehension on the part of the lamp factory. They took it up with great reluctance. It took a long period of correspondence. When the first lamps came out they were hopelessly wrong. We argued the matter at great length. Finally, as a last resort I asked the lamp factory to send me the diameter and length of the filament required for a given candle power lamp. On getting this information I went into the stock room and picked out a fuse wire of the size of the filament they had specified; then went over to Mr. Burkhalter's shop, and with his assistance turned up a wooden cone, the angle of the faces being practically the angle of the cone of rays from the focus to the lamp. We then wound the right length of fuse wire up on this cone in identically the form that is used today in the stereopticon lamp, packed the little cone and the fuse wire on it in cotton, and sent them on to the lamp factory. Inside of a few weeks they had bulletins out on the new headlight and stereopticon lamps. Mr. Burkhalter, the real inventor, has never received the proper credit, although it was really his personal invention.

We have here tonight a gentleman who has had a great deal of experience in incandescent lights of a certain kind—the lamps that wink when the telephone is pulled down—and I will ask Mr. McMeen if he will give us some of his personal experience in regard to the telephone lamp.

S. G. McMeen: The lamps to which Mr. Babcock refers are those which are associated with telephone lines and telephone cord circuits in the very widely used manual common battery switchboard system. They are interesting from the lamp point of view because they are very small, representing a special phase of lamp manufacture, and because the making of them is a large industry. Several millions of such lamps are in daily use.

The problem which these lamps represent is not one for the illuminating engineer, but is more closely allied to the electric sign industry, as the lamps are used solely for signal purposes. The usual practice is to mount each such lamp behind a slightly opalescent lens. The dispersion of rays enables the signal to be a very pronounced and clearly defined one, though the lamp has a diameter of only about a quarter of an inch.

In the earlier applications of these little lamps a great many troubles were experienced. They arose principally from the fact that, because the lamp is so small, the ratio between the space occupied by the filament and the total space exhausted made the getting of a sufficient vacuum rather hard. Another difficulty was the very low voltages on which the first lamps had to burn. These were usually four or eight volts, which made the filament rather short, and on account of the small current allowed the filament was very much more delicate than its support. Furthermore, the lamps are used for two purposes, the greater number of them being mounted with relation to the lines, as calling signals, and a smaller number being mounted with relation to the connecting cords, as supervisory signals. These latter lamps stand in a keyboard upon which the connecting plugs are dropped as they are taken out of service, in sockets in which the plugs run back when so dropped. The amount of jar so occurring in regular practice was sufficient to run the breakage of filaments in these keyboard lamps up to an excessive amount; and at one time in the early days, orders actually were issued to operators to restore plugs carefully by hand to their keyboard places on taking down a connection.

To place so great a burden on operating as a mere result of using lamps not hardy enough was plainly a thing not to be permitted. The natural solution of the problem came about by improving the type of lamps manufactured and by changing the electrical conditions under which the system operated. Greater skill was gained in making the lamps; the processes of exhaustion were improved; the voltage was raised to about twenty-five, at the same time simplifying the whole scheme of circuits; and the lengthening of the filament gave it elasticity enough to decrease the breakage to a reasonable amount.

Interesting experiences were gained during these efforts, and an amusing one occurs to me. The filaments of the little lamps were made by the cellulose process, filter paper being dissolved in a solution of a caustic alkali in water. This cellulose "syrup" was squirted into a rotating jar of alcohol, which dissolved the water and alkali and condensed the cellulose into a thread. The alcohol was recovered for further use by distillation, so as to leave the water and alkali behind. The process went on very nicely until the Federal Government stepped in to stop the running of an illicit still. A distiller's license had to be taken out before the manufacture could continue.

Relative to lamps in general, as energy translating devices, I am reminded of an amusing situation which rearises each year in a certain university. Each of a considerable number of students is given a jar containing a known weight of water, together with an incandescent lamp, a source of current, a volt-

meter, an ammeter, a thermometer, and a watch. He causes the lamp to burn while immersed in the water, and observes time, rise of temperature, current and potential.

After repeated trials each student admits his inability to account for more than 96 or 97 per cent of the energy absorbed, and the expression on his face is a study when he discovers that what he is calling a loss of 3 or 4 per cent really has escaped the observation of his instruments because it was emitted as light.

It is well, in considering metallic filament lamps, not to be misled by the ratio between the blackening of the bulb and the falling off in candle power. It is evident that the metallic filament lamp is much superior in this regard and that the blackening of the glass does not indicate anywhere near the same degree of lowering of light. It is well not to be too sure that we have reached the final solution of incandescent lamp practice and to keep in mind the thought suggested by Steinmetz as to the possible discovery of an allotropic form of carbon which may restore that element to a useful position in the art. One of the wise men of our time, Mr. Robert Kennedy Duncan, has said that radical developments in an art come in two general ways—along the border line between two sciences or by pushing known phenomena to their limits. The development of the metallic filament lamp illustrates very prettily both of these thoughts. The production of the materials themselves is on the border line between two sciences; the use of the material represents a case of extreme localized high temperature.

The Chairman: I am sure we have all been very much interested in these telephone experiences. Is there anyone here who can add anything to the history of the incandescent lamp art—any kinks or ideas that you have?

H. Y. Hall Jr.: There is a point I would like to see brought out, and that is the reduced effective life of the tantalum lamp when used on an alternating current circuit. Mr. Holberton's statement that it might be possible to use tantalum or tungsten lamps on his 200-volt circuit brought to my mind a recollection of seeing somewhere the statement that the tantalum lamp was unsuited for alternating current on account of the effect of alternating currents on the filament; it seems to break up or disintegrate the filament; and that the life is very much shortened on the alternating current circuits I take it that all the curves and data given tonight and the comparisons were made with direct current, and not alternating. I would like to ask Mr. Alvord what the effect is.

R. M. Alvord: Just exactly what that effect is I cannot say. The life is somewhat shorter on the alternating than on the direct current; the last figure I think was something like two-thirds of the number of hours. I would be very glad to have Mr. Sherwood confirm that, and I will give you the definite figures if you desire.

C. L. Cory: One point that has been touched upon—I mentioned it very briefly—is the very great difference in the quality of the light. Those who have used the tungsten lamp for reading or doing any work exacting on the eye have noted that the light is much whiter than that from the carbon lamp. There is not only the advantage of higher economy, but also improved quality.

One thing shown by those curves is the large current when the metal lamp is first thrown in, during the first fraction of a second as shown by the oscillograph. Of course, the increase of resistance in the metal lamp filament with increased temperature is just the opposite from the change in the resistance of the carbon lamp.

The Chairman: Mr. Holberton, could you not cast some light on that tantalum filament question?

G. E. C. Holberton: In taking up the matter of overcoming the objection to the 200 volts we took up the use of the tantalum lamps, and on the basis of getting from 800 to 900 hours actual time from the tungsten lamp, the manufacturers told us that we could count on 600 hours in the use of tantalum lamps in alternating current.

H. Y. Hall Jr.: It would not make so much difference in the case of the carbon lamp.

G. E. C. Holberton: That light is very much the same as the tungsten. You have got to try that on the basis of a 3½-watt lamp. So that for residence lighting, where rates are highest, naturally the saving is considerable; and in heavier districts, where the lighting is dense, the difficulty is overcome by the use of 100-volt lamps.

S. J. Lisberger: When I was at the Stanley factory they were working on a small transformer for use with a low voltage, 25 volts, lamps. That was a very neat device, very small. They did not have any figures on the cost or efficiency of that. I would like to know if Mr. Alvord can supply anything on that.

R. M. Alvord: We have not been supplied with the cost of those concentrators. They are trying them out in the East, and a number of the engineers from Schenectady were at work on them. They were very much interested in it. The compensator is 2½ inches in diameter; it is a little globe that fits under the socket, and the men who have been experimenting with those tell us that the results to be obtained from the light and efficiency from the voltage of 27 volts is remarkable in the tungsten lamp. We are hardly in a position to give you the data on that until they have given it a fair trial.

The Chairman: Is there anyone present that has had any experience in testing incandescent lamps after they are turned out of the factory. I would like to ask for some information for my own use because I have been receiving lately some inspection reports on lamp tests made at the factory and I must say that it shows an astonishing lot of poor lamps, the rejections in some cases on ordinary specifications—that is, what are called the maker's standard specifications—the rejections have been as high as total, other lots 80 per cent, other lots 50 per cent; and at that I mean 50 per cent of several thousand lamps tested. To me it was astonishing, and I would like to know if any other user of lamps has had any similar experience.

S. B. Charters: Carbon lamps, do you mean?

The Chairman: These are carbon lamps entirely.

S. B. Charters: Any special voltage?

The Chairman: No, scattered. You can readily understand that the lamps used by the Harriman Railway and Steamship lines cover a wide range.

S. B. Charters: I may be able to give you some information on that. I have just completed a series of tests on five different makes of lamp. The number was rather small, only six of each. They were tested for initial candle power and also for light, for 600 hours. As I said, there were five different makes. Four sets were of 110-volts and one set was of different voltage. In no case did the average come to 16-candlepower. The lowest set gave an initial candle power of 13.25. They were burned through the 600 hours. They were calebrated over 600 hours and showed a gradual decrease. The lamps all went down, but all remained above the 8 per cent of the normal rate. One standard developed slightly better than 11-candlepower. The best lamp developed a trifle better than 13-candlepower. In almost all there was a noticeable blackening, and in a number of the poor ones they showed a red discoloration. I doubt that from so small a number as six you could form a fair judgment; but the lamps would show fairly well, as the individual lamps of the same maker would not vary very largely. That is the experience we have had with five makes.

Mr. Babcock: Our annual lamp purchases for all the lines will run to nearly 300,000. Of course, that is not large as compared with central station requirements, but is large enough to come to a pretty fair average as to quality, and I had hoped to get some corroboration or discussion on that point.

C. J. Wilson: I think you have omitted something very important. We have not heard anything about the Nernst lamps. I think the Nernst lamp has an efficiency nearly that of the tungsten lamp. The representative on this Coast will guarantee a replacement or maintenance charge of 5 mills per kilowatt hour. I would like to hear from somebody on that.

The Chairman: Is there anyone present who can say a good word for the Nernst lamps?

S. J. McMeen: Mr. Babcock wishes to know if anybody can say a good word for the Nernst lamp. Under proper conditions it is a good lamp. It gives a soft light with a very excellent spectrum. There is no denying that it makes a demand upon the circuit for reasonably uniform voltage and that it has no particular preference for direct currents. Also it is not as prompt in responding to the turn of the switch as might be wished.

The association of an incandescent lamp with the heater relay hastens matters somewhat, as the ordinary incandescent lamp will give light while the heater is bringing the glower into action, and will go out as soon as the glower begins to give light on its own account and the relay turns off the heater.

As a substitute for the shortcomings of the average manufacturer, the Nernst lamp is most satisfying, and I am presuming that the lamp itself has to bear a great deal of scorn and contumely because of the hard time it has had responding to voltage variations of, for example, from 101 to 139 volts on a nominal 110-volt circuit.

Professor Cory: I had supposed we were not to get to the point this evening, when the voltage varies from somewhere around 90 to 145 volts, but I would like to ask Mr. Alvord how the change of candle power of the tungsten lamp compares with the carbon lamp at extreme fluctuations of voltage. Were curves showing this comparison shown?

R. M. Alvord: There was one, where two sets of curves crossed in the middle, and it showed the variation of the candle power in the tungsten was much less than the other lamp shown.

The Chairman: I hope that that letter will be published in the Journal of Electricity, Power and Gas with the more important of those curves, because certainly the users of lamps want to study those data.

S. J. Lisberger: Speaking of voltage variation, I presume you mean the candle power?

C. L. Cory: I mean the candle power as it varies with change of voltage.

S. J. Lisberger: When I was in New York the Edison people were telling me of some of the precautions they were taking to prevent a general shutdown on the system, as the thought was always present to the New York Edison people what would happen if they had a total station shutdown. In view of that they experimented with the tungsten lamps, hoping that they could hold the load with their storage batteries, even though the voltage were to drop quite low. To that end they made experiments. They found it was a failure.

C. L. Cory: It was decidedly better than the carbon lamp, was it not?

S. J. Lisberger: Yes.

The Chairman: If my memory serves me correctly, the New York Edison people about a year ago experimented with a total shutdown.

S. J. Lisberger: They have never had the current off the line in their whole experience.

The Chairman: They might not have had a shutdown, but they did not have light in the central part of the city.

G. E. C. Holberton: Answering Professor Cory's inquiry as to the effect of voltage variation on the tungsten lamps, I beg to recite the following experience: 'In putting the electroliers in the downtown district you find that they use tungsten lamps, and those were put up rather hurriedly. The merchants wanted them lighted before Christmas. We had special cables. When we got the cables in they took a look at the lights and they were very much pleased with them. I thought I would see how the voltage was. If I remember correctly they were 118-volt lamps, but by actual measurement at the base the voltage was 104. That is a drop of 14 volts, which would have meant a very yellow light with the carbon filament lamp.

The Chairman: Anybody else? If not, I will declare the meeting adjourned.

An adjournment was here taken.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS' ANNIVERSARY DINNER.

The American Institute of Electrical Engineers celebrated its Silver Anniversary in a dinner at the Hotel Astor, New York City, March 11th. The celebration was made the occasion for attempting various new electrical effects. The large ball room was set as an actual scene in Venice, the guests looking through an open balcony at one end across the Grand Canal, and the Doge's Palace. At the other end was a view of the Rialto, seen through palms and shrubbery. In each of the windows was set a transparency showing some view in Old Venice, while the large drop pieces were so illuminated as to give the effect of a moonlight night. At the back of the speaker's table were two large American flags held up by an eagle and all the stars in the flag were illuminated, each with an individual tungsten lamp of full candle power. In the open balcony around the hall dense masses of foliage and flowing plants were placed, with Cooper Hewitt mercury lamps behind them, giving the effect of early spring sunshine. On each table, instead of the customary flickering wax taper, and obviating the wiring of each of the fifty tables for incandescent light standards, there were used small silver vases; in each vase was a small storage battery, to which were wired three miniature lamps. Over these was placed a bowl of glass resembling a block of ice, through which were orifices in which were set blush roses in water; so that the lamps threw their beams backward through the glass to the flowers with brilliant and softened effect. Every table was thus illuminated without any obstruction of view or any hindrance to conversation. Outside the hall was a huge sign representing the badge of the institute wired with about 250 incandescent lamps, and inside the room, over the speakers' table, was another sign, having the badge as a transparency and the words "Silver Anniversary" picked out in small tungsten lamps. All these novel effects were most successful. President Ferguson, of the Institute, was chairman and toastmaster, and his opening remarks dealt with the success of the Society. Cable messages of congratulation were read from the national electrical societies of England, Germany and France, and telegrams of good wishes were received from Professor Alexander Graham Bell in Nova Scotia, Charles F. Brush in Cleveland and Thomas A. Edison in Florida. Greetings of the Sister Societies were offered by President Jesse M. Smith, of the American Society of Mechanical Engineers. The toast of Charter Members was responded to by Professor Elihu Thomson, to whom, with six other charter members present, a diploma of thanks and congratulations was presented in recognition of the work of 1884. Mr. Frank J. Sprague made a brilliant speech on behalf of the Past Presidents, of whom no fewer than nine were present, and he stated that these "elder statesmen" had formed a separate organization whose services were at the command of the Society for consolidation or for any other duties that might be assigned to it. At the end of his remarks he presented a massive silver loving cup in the name of sixteen of the past presidents now living to Mr. T. Commerford Martin, the senior surviving past president. President Humphreys, of Stevens Institute of Technology made an able speech on Engineering as a Profession, and on the importance of the discharge of their duties as citizens by electrical engineers, particularly in the formation of correct public opinion as against the fads and fancies of theoretical economists and too practical politicians. The dinner was brought to a conclusion by the singing of "Auld Lang Syne," as a solo, by Mr. A. Foxton Ferguson (B. A. Oxon), the English exponent of folk-lore songs, under whose splendid leadership the whole assembly joined in the chorus. During the dinner President Ferguson stated that the Institute had 6,334 members, and were closing the present month with 6,600, not including about 1,500 students in university branches. Over fifteen sections and branches were represented at the dinner, including Toronto, Can., San Francisco, and Austin, Texas.

HEAT DISTRIBUTION OF AN OIL GAS WORKS AND GAS ENGINE.

BY J. C. H. STUTT.

The reasons for this discussion before the Association was to determine why the large gas engine units do not successfully compete with the steam engine on the Pacific Coast where crude oil is used for both making illuminating gas and generating steam, and we believe this subject will be of interest to other readers, and we invite a discussion and criticism in the friendly spirit that this is offered.

In the manufacture of illuminating gas from crude oil it requires in general practice from 9 to 10 gallons of oil to make each 1,000 cubic feet of gas, and averaging the oil as obtained here, coming mixed from many different wells at 8 pounds per gallon, we would have at the best practice 9x8 or 72 pounds, as required to make 1,000 cubic feet of gas, and average crude oil will show 18,500 B. T. U. per pound, so we would have 72x18,500 or 1,332,000 B. T. U. required to each 1,000 cubic feet of gas.

Good gas of this kind will show an average analysis of about 650 B. T. U. per cubic feet, and 1,000 cubic feet will equal 650,000 B. T. U., and the difference or 1,332,000 minus 650,000 B. T. U. equals 682,000 B. T. U., will be the loss due to manufacture, or 51.2%.

From numerous tests that are reported in compiled tables, gas engines will require from 14 to 21 cubic feet per horsepower hour at maximum load, and taking the average of this at 17.5 cubic feet we would have 1,000 cubic feet, about 57-horsepower, and for convenience will calculate on this basis.

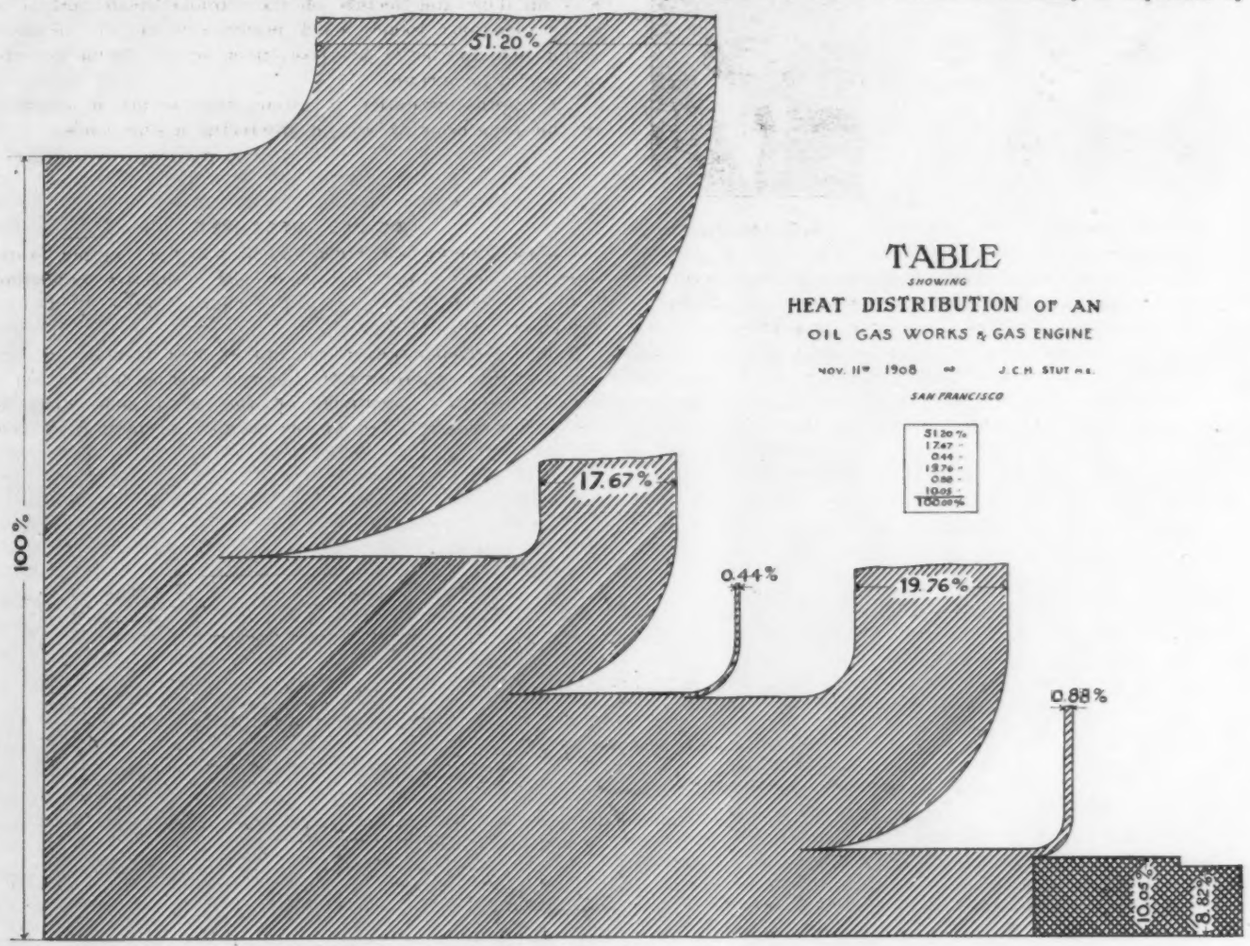
As the gas engine will use about 11 gallons of cooling water per horsepower hour we would have 11x8.34 pounds per hour, and 57 h. p. equals 57 x this or about 5,230 pounds, and taking the average cooling water injection at 65° and discharge at 110°, or a difference of 45°, which, multiplied by 5,230, equals 235,350 B. T. U. as loss due to cooling water required, or 17.76% of 1,332,000 B. T. U.

The power required to pump this amount of cooling water under average conditions we estimate at 4% of 57 h. p. or 2.28 h. p., and the mechanical efficiency of 2.29 h. p. expressed in B. T. U. will be 2.28x60x33,000, divided by 775, or 5,825 B. T. U., or 44 % of 1,332,000 B. T. U.

Loss due to manufacture	682,000	
Loss due to cooling water	235,350	
Loss due to pumping water	5,825	
Total accounted for	923,175	923,175
Total available and unaccounted for	408,820	B. T. U.

The unaccounted for B. T. U. as expended in exhaust, radiation, etc., we determine as follows: The mechanical efficiency of 57 h. p. will be 57x60x33,000 divided by 775, or 145,626 B. T. U., or 10.05%.

The friction of the engine we place at 8% of 57 h. p., or 4.56 h. p., and as before the mechanical efficiency is expressed by 4.56x60x33,000, divided by 775, or 11,650 B. T. U., or 88% of 1,332,000 B. T. U.



Engine efficiency	145,626	B. T. U.
Engine friction	11,650	B. T. U.
Expended in useful work	133,976	B. T. U. or 10.05%
Available and unaccounted for	408,820	B. T. U.
Mechanical efficiency of engine	145,626	B. T. U.
Loss due to exhaust, radiation, etc.	263,194	B. T. U. or 19.76%

RESUME.

Loss due to manufacture	682,000	B. T. U. or 51.2%
Loss due to cooling water	235,350	B. T. U. or 17.67%
Loss due to pumping water	5,825	B. T. U. or .44%
Loss due to exhaust, etc.	263,194	B. T. U. or 19.76%
Loss due to engine friction	11,650	B. T. U. or .88%
	1,198,019	B. T. U. or 89.95%
Recovered in useful work	133,976	B. T. U. or 10.05%
	1,331,995	B. T. U. or 100%

The chart accompanying will show when using 20 cubic feet for horsepower hour 8.82% recovered in useful work on this same basis of calculation.

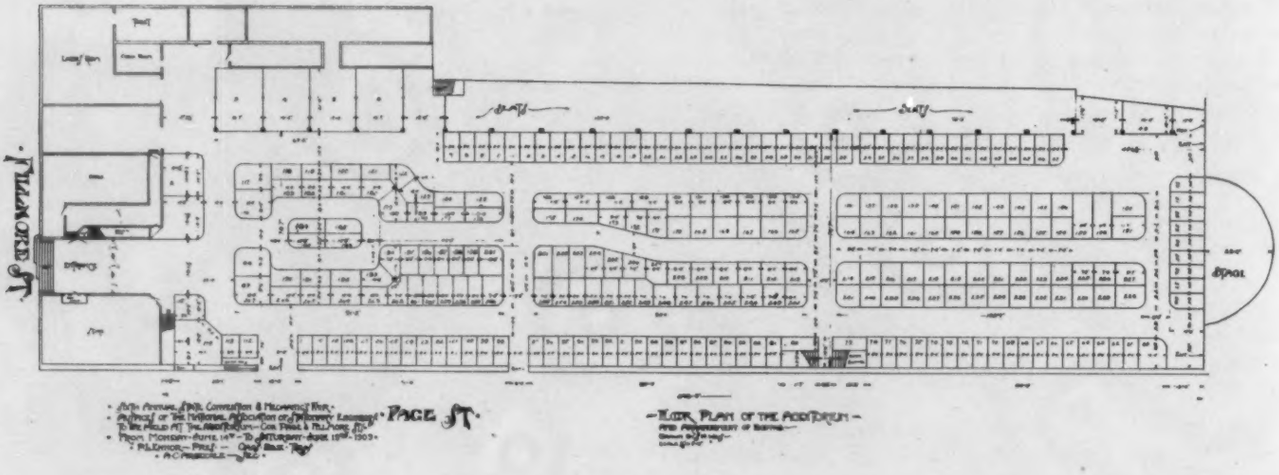
NATIONAL ASSOCIATION OF STATIONARY ENGINEERS' CONVENTION EXHIBITION.

The National Association of Stationary Engineers will hold its Sixth Annual State Convention for one week in the Auditorium Pavilion, corner Page and Fillmore streets, from June 14th to June 19th, 1909. In connection with the convention an interesting feature will be the exhibition of machinery and electric appliances, provided by the business firms of San Francisco and vicinity.

P. L. Ennor

A. C. Arbuckle

The National Association of Stationary Engineers was organized in 1882 for educational purposes, and for the uplifting and promotion of steam engineering as a profession. Its work has enlisted the support and encouragement of the manufacturers and power plant owners throughout the country. The organization has expanded and now has branches in every part of the United States and Canada.



In this exhibit, however, they intend to cater to the machinery and mechanical specialty people, with a view of making it especially interesting to the engineer and mechanic, as well as the public at large.

Delegates with their families and friends, from all parts of the State, will be here, and every opportunity will be afforded the exhibitors to display their lines to the very best advantages.

The committee in charge of the convention and exhibition are: P. L. Ennor, president; A. C. Arbuckle, secretary; Chas. Dick, treasurer; W. M. Jenkins, H. W. Noethig, John Traynor, B. E. George, M. W. Herzog, J. L. Davies, John W. Carter, J. E. Green, D. E. Brewer, business manager, office No. 830, Monadnock Building. Telephone Kearny 5855.

NEWS OF THE STEAM ENGINEERS.

California No. 3, National Association of Stationary Engineers, held their regular meetting on the evening of March 17th and many matters of interest to the engineers were discussed, upon the conclusion of which, upon the invitation of Mr. H. D. Saville, chief engineer of the Merchants' Exchange Building, the members adjourned to the exchange room to witness the operation of an extremely ingenious mechanical contrivance—an orange-wrapping machine, which wraps oranges with labeled paper at the rate of a carload a day. The inventor, Mr. Ballard, went to great pains to explain the intricate workings of this more than human machine, and the engineers considered themselves well repaid for the time spent in viewing it.

The educational committee of the association desires to announce that on the evening of March 31st Mr. Baker, district engineer of the Westinghouse Machine Company, will give an illustrated lecture on the Parsons steam turbine at the association's rooms, which promises to be fully as interesting and instructive as those given by Mr. Davis recently on the Curtis turbine.

A cordial invitation to attend this lecture is extended by this association to anyone interested in this subject.

DAVID THOMAS, Secretary.

BOOKS RECEIVED.

"Heat Energy and Fuels," by Hanns Von Juptner, translated by Oscar Nagel, 306 pages, 6x9. McGraw Publishing Company, New York City, and Technical Book Shop, San Francisco. Price $3.00.

This is a translation of the first of four volumes by Professor Juptner dealing with chemical engineering. After a general historical treatment of the origin and forms of energy, the author takes up the chemical technology of heat and fuels. The first three chapters are concerned with the measurement of high temperatures, and include a description of the various pyrometers by which this may be accomplished. The next section details the methods for determination of heat combustion both theoretically and practically, according as it is complete or incomplete. Types of both direct and indirect calorimeters are illustrated. The final chapters deal specifically with wood, peat, coal, charcoal, oils and gases, giving in each case the method of analysis and manufacture. Much of the matter has been condensed into tabular form for ready reference and comparison. While primarily of interest to the chemist and metallurgist, the book contains information of value to both steam and gas engineers, as it embodies recent experimental data. The chapters on the gasification of fuels are of especial value.

CURRENT COMMENT

The National Electric Light Association's twenty-second annual convention will be held at Atlantic City on June 1, 2, 3 and 4.

Blast furnace gas power lost amounts to nearly 2,000,000 h. p., although this is being reduced by the installation of gas engines to consume the power.

The production of gas from peat is to be experimentally tried by the Canadian Government, which has appropriated $15,000 for a fuel-testing plant at Ottawa.

A self-igniting flame with high intrinsic illuminating power is produced when a mixture of calcium carbide and calcium sulphide is thrown into water.

Electric propulsion for Atlantic liners is under experiment by British engineers, who figure that electric drive will increase the speed of rotation of the screws.

Examination for tracer of mechanical drawings in the Panama Canal Service is announced by the United States Civil Service Commission on April 21, 22, 1909. The entrance salary is $100 per month.

A new aluminum alloy consisting of 87 per cent aluminum, 8 per cent copper and 5 per cent zinc has been patented by Fried. Krupp, of Germany. It casts easily, is homogeneous, easily worked and very brilliant.

Calcium carbide annual production is nearly 200,000 tons, of which the United States and Canada furnish 38,000. Italy 32,000, France 27,000, Norway 25,000, Switzerland 20,000, Austria-Hungary 20,000, Sweden 12,000 and Germany 9,000.

Electric fans for picking chickens has been devised for wholesale poultry dealers. It is stated that all the feathers and down are removed in a few seconds by placing the dead chickens into a receptacle equipped with a powerful electric blower.

Lusol is an impure benzine resulting from the distillation of coal tar, which furnishes a cheap light by means of a specially designed lamp and mantle. It is finding considerable application in France, as it costs one-fifth as much as kerosene.

Transmission of wireless messages over water is better than over land, possible because the radioactive emanations from the earth, which make the air conductive, interferes with the transmission of electric waves. No such radiations arise over water.

One charge ran an electric automobile 142 miles at an average speed of fourteen miles an hour in a test recently completed by a prominent manufacturer. The car ran eighty-five miles the first day and completed the trip next day after standing over night.

The most powerful wireless station in the world is to be erected by the Government at Washington, D. C. A 600-foot tower is to be put up and instruments provided that will be powerful enough to be beyond interference by commercial wireless stations. The total cost is estimated at $182,600.

Producer gas differs from water gas primarily in the source of the oxygen, the former getting it from the air, the latter from water. In each case carbon monoxide is produced by passing either air or water over glowing carbon. On account of the hydrogen present in water gas it has from two to three times the theoretical thermal value of producer gas, according as it is produced at low or high temperature.

The production of nitric acid in this country is 108,380,387 pounds annually, valued at $5,232,527. This is manufactured by 41 companies all using sulphuric acid and sodium nitrate. The production of nitric acid from the nitrogen of the atmosphere by an electric arc has been introduced only experimentally.

The reduction of metallic oxides by carborundum takes place at the comparatively low temperature of 1,300 degrees C. The reaction is much like that of powdered aluminum in the thermit process. Experiments by Baraduc Muller in France that various alloys such as ferro-silicon can thus be made without the use of an electric furnace.

Wireless telegraphy in Brazil is under the control of a commission composed of representatives of the national telegraph department, the army and the navy. It has charge of the establishment of a wireless telegraph system for all Brazil, not only with respect to a system for army and navy and other national purposes, but for a public service as well.

A wireless typewriter has been designed by H. Knudsen, the inventor of the system of photo-telegraphy bearing his name. By means of a transmitting typewriter various electrical impulses corresponding to the several letters of the alphabet are sent out and received on a similar typewriter or linotype through a detector and relay. It thus becomes possible for one operator to set type on any number of receiving machines on land or sea.

The largest testing machine yet constructed is being built for the Structural Material Testing Laboratories of the United States Geological Survey. It is essentially a large hydraulic press with a maximum clearance of 65 feet between heads. It is to have a capacity of 10,000,000 pounds pressure with an accuracy of at least one-third of one per cent for loads of 100,000 pounds or more. Its primary purpose is to determine the effect of flaws and other defects in large blocks of natural stone.

Hydro electric power for fertilizer manufacture is being sought by representatives of European interests utilizing atmospheric nitrogen. A report from the consular service states that an industry of this kind is needed, as the imports of Chilean nitrate of soda now amount to $14,000,000 a year. Difficulty is being experienced, however, in securing suitable water powers at reasonable cost. Governments of other countries are said to be offering inducements for the location of the extensive nitrate mills which the company proposes to erect.

The use of electricity on the farm was recently demonstrated at an electrical exposition at Marseilles, France, in which neighborhood agricultural labor is at a premium because of the migration to the cities. An exhibit of a modernized farm occupied 12,000 square feet. Water was raised from a well by a motor-driven centrifugal pump. Plows, threshing machines, huskers, winnowers, etc., were all motor-driven. The wine cellar was equipped with a wine pump, grape picker and press, all electrically operated. The poultry yard contained a bone crusher, herb cutter, electric brooder and breeder. In the barn was an electric carrot cutter, grain crusher, oil cake mill, root cutter and straw cutter. The cows were milked and the sheep sheared by electricity. The dairy had an ice-making machine and was furnished with electric-driven cream separators, beaters and churns. All shop tools were electric driven, including the forge blower. The home and laundry were also supplied with all the modern conveniences offered by electricity.

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POWER AND GAS

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FOUNDED 1887 AS THE
PACIFIC LUMBERMAN, CONTRACTOR AND ELECTRICIAN

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Business Training of the Engineer.

There are few better trained business men than engineers, graduation speeches notwithstanding. So often has the engineer's lack of business training been deplored that some people are beginning to believe that it is true. The cause of this misconception is two-fold, first, in regarding an inexperienced student as an engineer, and second, in a mistaken idea as to what constitutes business.

A recent graduate from an engineering college, as a rule, has not the same business experience as is possessed by a young man of the same age engaged in mercantile pursuits during the time of the student's technical training. This business handicap may be so great as to relegate the engineer to a subordinate position, just as some other deficiency fills the ranks of clerks and bookkeepers. But a successful engineer, after a few years' experience in handling men and affairs, is as good a business man as his commercial brother.

In America "the product of the industrial and commercial age, the age of prose," the meaning of business as given us, "a pursuit or occupation that employs or requires energy, time and thought," is usually misconstrued as applying only to commercial and financial pursuits. Energy, time and thought are as essential factors in an engineering project as are "attention, application, accuracy, method, punctuality and dispatch," which fifty years ago were defined by Samuel Smiles as "the principal qualities required for the successful conduct of business of any sort." It is only by the closest attention to detail and by the most unremitting application that an engineer is enabled to design and construct a system in accordance with commercial requirements of rapidity and accuracy. Where is there a business where a mistake carries with it such disastrous consequences? How much finer is this conception than is the modern tendency to approve cunning and sharp practice as the necessary attributes of a successful business man.

An engineer supervising a power installation should not be expected to show marked ability as a financier any more than a banker is expected to design bridges. Each is a specialized business requiring expert knowledge. The business of engineering is concerned with the "art of directing the great Sources of Power in Nature for the use and convenience of man." It is thus doing a greater work in advancing our material welfare than is accomplished by piling up dollars. The pyramids of Egypt are yet standing, although the wealth of Croesus is but legendary.

PERSONALS.

H. F. Froesch, Pacific Coast representative of the Federal Electric Company, is in Los Angeles.

W. S. Heger, assistant to the president of the Allis-Chalmers Company, Milwaukee, Wis., is now in San Francisco.

Mr. S. C. Dyke, of the Electric Porcelain Company, East Liverpool, O., spent the past week in San Francisco.

Dorsey Ash, Asso. M. Am. Soc. C. E., announces that he has removed his office to the Mills building, San Francisco.

R. B. Cressman, representing Pass & Seymour, Inc., of Solway, N. Y., is in Los Angeles, whence he will come north.

W. S. Berry, sales manager of the Western Electric Company, San Francisco, left for an extended trip through the East on March 24, 1909.

T. C. Turley, president of the Chicago Insulated Wire and Manufacturing Company, was in San Francisco last week with William Knight of Los Angeles.

M. E. Launbranch, railway selector expert of the Chicago office of the Western Electric Company, and Mr. E. K. Dyer, traveling telephone expert for the same company, are in San Francisco in attendance on the conference of superintendents of railway telegraph, which has been in progress during the past week.

BOOKS RECEIVED.

"Theory and Calculation of Transient Electric Phenomena and Oscillations." By Charles Proteus Steinmetz. 556 pages, 6x9; 102 diagrams. McGraw Publishing Company, New York City, and Technical Book Shop, San Francisco. Price $5.00.

Transient electrical phenomena are those which accompany the readjustment of the energy stored in an electric circuit containing resistance, inductance and capacity. Although they exist for but a short time or space until permament conditions are established, their instantaneous value may be great enough to destroy the circuit unless it has been designed to withstand these extraordinary conditions. Their nature, their occurrence and their magnitude are analytically discussed in this volume. Beginning with the simplest case, involving either resistance, inductance or capacity, the author successively takes up cases involving any and finally all of these factors, deducting mathematical expressions for their value. The treatment is broadly divided into four sections, treating respectively of transient phenomena in time, periodic transient phenomena, transient phenomena in space, and transient phenomena in time and space.

Under the first head is given a general explanation and definition of the constants of an electric circuit, and an investigation and discussion of the simpler forms of transient terms, such as the starting of a continuous current lighting circuit, the excitation of a motor or generator field for either direct or alternating current. It includes a complete treatment of oscillating currents and of low frequency surges in high potential systems. An analytical discussion is given of a divided circuit and of mutual inductance. Finally a formula is derived for the determination of a general system of circuits, with specific attention to magnetic saturation and hysteresis, the transient term of the rotating field and short circuit currents of alternators.

Periodic transient phenomena of engineering importance include those occurring in the control of an electric circuit, in the operation of high frequency currents and in the rectification of alternating currents. Each of these are discussed in detail, particular attention being given to rectification, both mechanical and arc. The chapter on the mercury arc rectifier is remarkably lucid in its explanation.

Under transient phenomena in space is discussed long-distance transmission lines and high potential transformers. A section is devoted to an analytical discussion of the distribution of magnetic flux and of alternating current, and one takes up the velocity of propagation of an electric field. The concluding chapters give calculations of conductors intended to convey current of very high frequency, such as lightning discharges, high frequency oscillations in transmission lines, and currents used in wireless telegraphy. In the last section the author first deduces a general expression for the current and voltage of an electric circuit. The section includes a discussion dealing with standing waves, traveling waves and free oscillation, in simple and complex circuits, concluding with illustrations of the effect of the discharge of an inductance into a transmission line.

All of these phenomena are graphically illustrated by curves and oscillograms which facilitate comprehension of the text. The treatment is essentially mathematical and can be comprehended only by one thoroughly versed in the calculus. The subjects discussed include some of the most important problems yet to be met in the field of electrical engineering, and while some of these are today of but scientific interest, it will be but a comparatively short time before their industrial application will demand attention. The man who has thoughtfully assimilated the contents of this volume will be in a position to solve practical problems. The book is above ordinary criticism and on the same high plane as the "Theory and Calculations of Alternating Current Phenomena," by the same author, which has ever been recognized as the standard.

"Practical Calculation of Transmission Lines," by L. W. Rosenthal, 93 pages, 6x9. McGraw Publishing Company, New York City, and Technical Book Shop, San Francisco. Price $2.00.

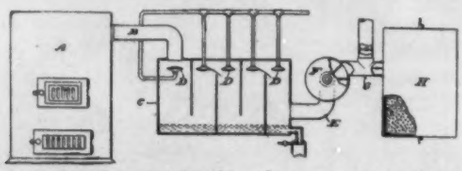
This book bridges a gap that has long existed in the line of electrical engineering, as it presents a direct method for the accurate and rapid calculation of conductors for direct and alternating current distribution. It consists essentially of formulas accompanied by tabulated data and constants for the solution of wiring problems, all illustrated by numerous practical examples. The text is divided into six chapters, treating successively of direct current distribution for light and power; distribution for direct current railways; alternating current transmission by overhead wires and by underground cables; interior wiring for alternating current distribution and distribution for single phase railways. A number of existing fallacies are pointed out and as many new and original methods offered. Among these is one for determining the size of wire directly from volt losses in the line. Much time can be saved by using the several short-cut methods detailed. It is necessary, however, in all of these to use the author's tables, as the formulas are largely empirical.

SAN FRANCISCO, CAL.—Articles of incorporation of the Equitable Light & Power Company, capitalized at $750,000, have been filed with the County Clerk of San Francisco. The purposes of the company are stated to be, to make, provide, and supply electric current, water, water power, steam and electricity, electric light, heat and power to the city and county of San Francisco and to other cities and towns in the State. There is no mention of gas in the articles. Of the capital, $700 has been subscribed, each of the seven directors having paid for ten shares. The directors are C. B. Beal, general manager of the Bay Cities Water Company; Frederick G. Cartwright, A. E. Long, Leo G. Meyberg, Mountford S. Wilson, M. D. Levenson and James Fisher.

"The Electrical Operation of Railroad Shops" is the subject of Bulletin No. 4649 from the General Electric Company. The illustrations show independent drive of several machine tools.

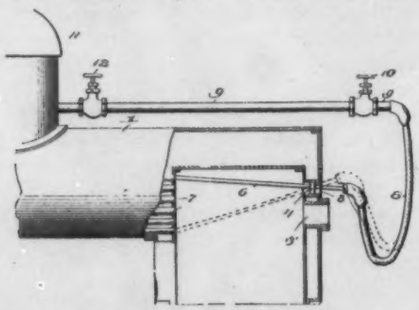
PATENTS

914,279. Process of Obtaining Nitrogen From Air. Oliver P. Hurford, Chicago, Ill. The process of obtaining free nitrogen from the air which consists in first burning a carbonaceous fuel in the presence of air of sufficient quantity for complete combustion to carbon dioxid and substantially free from



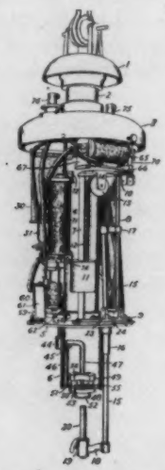
carbon monoxid, then subjecting the gaseous products to the condensing action of water to condense the steam and separate the carbon dioxid from the nitrogen and then leading off the nitrogen from the condensing chamber, substantially as described.

914,940. Boiler-Flue Cleaner. James J. Flynn, Atlanta, Ga. In a boiler-flue cleaner, the combination with a boiler having an opening formed in one end thereof, a tube adapted



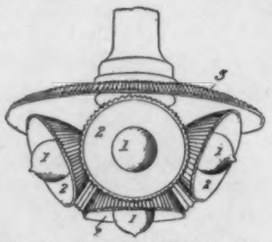
to be projected through the opening and to engage successively the flues in said boiler, a baffle plate formed with means for permitting a universal movement of said tube, and flexible means connected with a supply of gaseous pressure.

914,939. Electric-Arc Lamp. Richard Fleming and Cromwell A. B. Halvorson Jr., Lynn, Mass., assignors to General Electric Company. In an arc lamp, a frame work, an



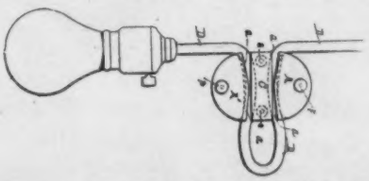
electrode comprising an annular member, means for securing said member as a whole in a position relative to the frame work which is independent of the duration of an arc therefrom, an axial member, and means for causing relative movement between said members whereby the arc is started from one of said members and transferred to the other of said members

915,056. Illuminator. Van Rensselaer Lansingh. New York, N, Y., assignor to Holophane Glass Company, New York, N. Y. An illuminating device comprising a group of



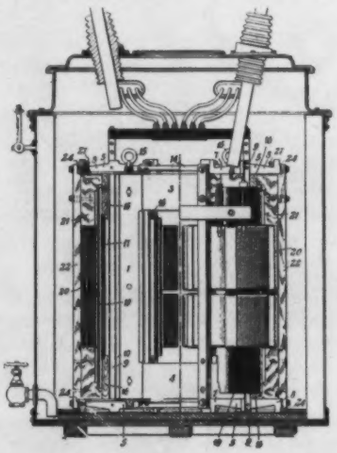
lights, an independent prismatic glass reflector for each light and a prismatic glass master reflector common to and inclosing all the lights and adapted to reflect the combined light in a downward direction.

914,768. Electric-Light Cord or Cable Adjuster. Frank E. Walker and Arthur C. Walker, River Point, R. I. An electric-light cord or cable adjuster consisting of a base, a block



removably mounted on said base and having a concave groove in each side clamping members, each provided with a convex groove in one side, said side having two cam-faces or straight edges converging mediately of said side, said clamping members pivotally mounted on said base at opposite sides of and adjacent to said block in such manner that the convex groove in said member and the concave groove in said block will conjointly constitute a curved passage-way for the cord or cable.

914,941. Transformer Structure. Charles Le G. Fortescue, Wilkinsburg, Pa., assignor to Westinghouse Electric and Manufacturing Company. In a transformer, the combina-



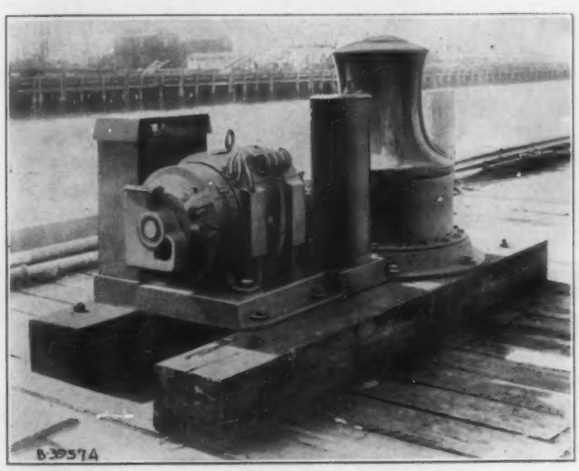
tion with a magnetizable core comprising a plurality of substantially parallel legs, and cross members joining the same, of brackets at the ends of the core legs, means for connecting the brackets at the respective ends of the core, means for clamping the core legs between and substantially concentric with the brackets at the ends thereof, coils surrounding the legs, and means for maintaining the coils in substantially invariable relations with respect to the said legs.

INDUSTRIAL

ELECTRIC MOTORS ON DOCKS.

The convenience of electric motive power is well illustrated in the applications shown in the accompanying views where electric motors are shown connected to a capstan and winch for use in hauling vessels up to the dock. In each case the outfit is entirely self-contained with the entire outfit on a single bedplate, which insures correct alignment of the gearing even after long service. This construction makes the installation of the outfit a simple matter, as it is only necessary to bolt the bedplate to a secure foundation and connect the motor to the power circuits. The location of the capstan may be chosen without reference to the power, for the wires may be run anywhere on the dock with much greater convenience at a substantial saving as compared to any other method of supplying power.

The illustration shows one of the two electric capstans supplied by the American Ship Windlass Company of Providence, R. I., to the Newport News Shipbuilding and Drydock



Electric Capstan.

Company, which they installed on piers in their shipyard at Newport News, Va.

With a capstan on each pier at the entrance of the drydock it is possible to haul the ships in very rapidly and accurately. The dock is one of the largest at any of the shipyards in the world and will take the largest American battleships afloat. It may readily be appreciated that powerful machines are required to do such work. Each winch is designed to pull 11,000 pounds at 30 feet per minute. The motors are standard Westinghouse, Type "K" series, wound motors running at a full load speed of 560 rpm. The speed is controlled by a standard Westinghouse R-27 controller.

The capstan is known as a 16" electric gypsy; that is, the barrel is 16" in diameter at the smallest part. The hauling rope is merely wound around the barrel four or five times and the loose end of the rope overhauled as the vessel is pulled into the dock by the winches. The winches were furnished by the American Ship Windlass Company of Providence, R. I.

The mining regions of Canada, Mexico and the Americas form a particularly fertile field for the application of gas power, owing to the high price of fuel. Plants similar to the above are in operation at Calgary, Canada; Wetaskiwin, Alberta, Canada; Cobalt, Ontario, Canada; Moncton, Canada; Bahia Blanca and Buenos Ayres, Argentine Republic; Iquique, Chile; Santos and Rio Janeiro, Brazil.

BENJAMIN TUNGSTEN FIXTURES.

The Benjamin Electric Manufacturing Company, with San Francisco headquarters at 161 New Montgomery street, have placed upon the market a number of tungsten devices supplementing their popular line of Tungsten Arcs and Adapters. Fig. 1 is their Two-Light Tungsten Adapter. It is furnished with rotating sleeve which makes it possible to attach

Fig. 1.

Fig. 2.

the device without turning. It is especially useful as a device for burning two lamps in series. Fig. 2 illustrates one of several new tungsten fixtures. The company has recently issued a new Bulletin No. 3, which is handsomely illustrated and contains valuable information on the use of tungsten lamps. It will be sent to any address upon request.

TRADE NOTES.

As a result of their steadily growing business and the resulting increase in stock, the Telephone-Electric Equipment Company have found it necessary to secure new quarters in San Francisco and are now located in the Merritt building, a modern fireproof structure at 612 Howard street.

Difficulties experienced in the past as a result of the separation of their general offices, sales rooms and warehouse have been overcome by bringing together in one building their entire organization, with ample floor space for a largely increased stock.

Among other lines they handle on the Pacific Coast are Simplex wires and cables, American copper and weatherproof wire, Stromberg-Carlson telephone apparatus, H. & H. switch goods and National Metal, Molding and Conduits.

Otis & Squires, manufacturers representatives, who have been located at 645 Howard street, San Francisco, for the past four months, will settle permanently on April 1, 1909, at 155 New Montgomery street.

TRADE CATALOGUES.

Bulletin No. 4646 from the General Electric Company is devoted to the G. E. tungsten incandescent lamp, for standard lighting service, 100 to 125 volts, 25, 40, 60, 100 and 250 watts. Bulletin No. 4647 shows the adaptability of G. E. tungsten lamps for series street lighting.

The Western Electric Company, New York and Chicago, has issued a unique booklet entitled "Satisfaction." This shows a number of photographs of President Taft using a Western Electric telephone. The facial expressions substantiate the title of the booklet. There are also a number of excerpts from the writings of Mr. Taft.

APPROVED ELECTRICAL DEVICES

CONDUIT OUTLET BUSHINGS.

½-inch aluminum coated single piece bushing. Approved Feb. 20, 1909. Manufactured by

P. R. Mfg. Co., 621 Bellevue Ave., Detroit, Mich.

CONDUIT OUTLET BUSHINGS AND COUPLINGS.

Enameled or tinned conduit outlet bushings for all sizes of rigid conduits. Approved Feb. 26, 1909. Manufactured by

Gradler Mfg. Co., Cleveland, Ohio.

FIXTURES.

"Benjamin" Tungsten Arcs, indoor and weatherproof forms, 4 to 6 and 2 to 4 light types. Nos. T-44, T-44-K, T-46-K, T-62, T-63, T-64, T-83, T-84 and T-85. Approved Feb. 23, 1909. Manufactured by

Benjamin Electric Mfg. Co., 42 W. Jackson Blvd., Chicago, Ill.

GROUND CLAMPS.

Adjustable ground clamps of copper, for use with ⅜ to 2-inch pipe. Approved Feb. 16, 1909. Manufactured by

American Metal Works, Germantown, Philadelphia, Pa.

INSULATING PAINT.

"Mogul" Electrical Compound. Approved March 3, 1909. Manufactured by

A. Grothwell, 352 West 25th St., New York, N. Y.

MISCELLANEOUS.

"O. K." Meter Connection Block. A porcelain cut-out block and metal cabinet designed for use in connecting wires to meters. Approved Feb. 26, 1909. Manufactured by

Pettingell-Andrews Co, 160-166 Pearl St., Boston, Mass.

RECEPTACLES—STANDARD.

"Bryant" 3 A. 250 V. Sign. Cat. Nos. 1700, 40488, 46749, 59108. Cleat, Cat. Nos. 9402, 9403, 921, 1011, 1123, 50715, 11221, 28795, 58949 (formerly 23209), 58300, 58301 (formerly 23210). Concealed, Cat. Nos. 50744, also 9447, fusible 2 A. 125 V. Moulding, Cat. Nos. 42543, 58302, 58950 (formerly 34152). Conduit Box. Cat. Nos. 9514, 9397, 40507. Rosette Receptacles cleat and concealed types, fusible 2 A. 125 V. Cat. Nos. 9434, 9436, 9438, 9404, 9405, 9406. Approved Feb. 21, 1909. Manufactured by

The Bryant Electric Co., Bridgeport, Conn.

RECEPTACLES—STANDARD.

"P. & S." Receptacles. 3 A. 250 V. Cleat, Cat. Nos. 870, 871, 821. Moulding, Cat. Nos. 670, 770. Removable Ring types, Cat. Nos. 577, 578, 877, 988. Sign, Cat. Nos. 973, 977, 975, 777, 1072, 821. Cat. Nos. 960 and 960 A. to F. incl. porcelain sign receptacles having lead wires soldered to terminals and sealed. Receptacles spaced on wires from 3 to 10 inches. Cat. No. 900. A double porcelain receptacle for use only in borders of double faced metal panel signs. Approved Feb. 19, 1909. Manufactured by

Pass & Seymour, Inc., Solvay, N. Y.

RECEPTACLES—STANDARD.

"P. & S." wall sockets 3 A. 250 V. (keyless) brass shell, Cat. Nos. 387, 0387, 455, 456, 367, 480, 481; Cat. Nos. 468 and 469, with metal keys. Porcelain shell, Cat. Nos. 2371, 02371, 237, 0237, 247, 0247, 1087, 107. Approved Feb. 26, 1909. Manufactured by

Pass & Seymour, Inc., Solvay, N. Y.

RECEPTACLES—STANDARD.

"Tregoning" Receptacles, 3 A. 250 V. Cleat type, Cat. No. 303. Sign, Cat. Nos. 300, 301, 302. Approved Feb. 23, 1909. Manufactured by

Tregoning Elec. Mfg. Co., 224 High St., Cleveland, Ohio.

RHEOSTATS.

"G. E." all capacities, 125-500 V. S. A. and S. B. Motor starting. SFA motor starting with field control. RA speed regulating, for continuous duty. Also, SO, RO and SFO with overload release devices which are inoperative during process of starting motor. Approved Feb. 22, 1909. Manufactured by

General Electric Co., Schenectady, N. Y.

ROSETTES, FUSELESS.

3 A. 250 V. "Fielding" Rosettes, cleat, concealed and moulding types. Cat. Nos. 433-438, incl., 441, 480. K. W. Rosettes. Cat. Nos. 481, 482. Approved Feb. 20, 1909. Manufactured by

H. T. Paiste Co., 32d and Arch Sts., Philadelphia, Pa.

SOCKETS, MINIATURE.

Miniature and Candelabra Sockets, ½ A. 125 V. Pendant Cat. No. 323. Candelabra Candle Socket, Cat. Nos. 327, 328 and 347. Approved Feb. 26, 1909. Manufactured by

Bryant Electric Co., Bridgeport, Conn.

SWITCHES, PENDANT SNAP.

"C. H." all porcelain. 6 A. 125 V.; 3 A. 250 V. for pendant use. Cat. No. 7000, with brass cap for fixtures or pendants. Cat. Nos. 7001 and 7002. 10 A. 125 V.; 250 V. pendant style. Cat. No. 7010. Approved Feb. 20, 1909. Manufactured by

Cutler-Hammer Mfg. Co., 12th St. and St. Paul Ave., Milwaukee, Wis.

SWITCHES—PENDANT SNAP.

"Perkins" 2 button type, single pole, 10 A. 125 V. 5 A. 250 V. Cat. Nos. 2353 and 2354 for either pendants or fixtures and 2359 for pendants only. Approved Feb. 19, 1909. Manufactured by

Perkins Electric Switch Mfg. Co., Bridgeport, Conn.

SWITCHES—ROTARY FLUSH.

"Perkins" 3 pole snap switches with vulcabeston commutator, 15 amperes, 250 volts, Cat. No. 2185, lock type No. 2050. Switch is provided with a special fibre lined brass collar and a cast brass mounting frame which are screwed to the porcelain base of the switch by means of screws and mounting posts. Approved Feb. 15, 1909. Manufactured by

Perkins Electric Switch Mfg. Co., Bridgeport, Conn.

SWITCHES, SURFACE SNAP.

"Perkins" three-pole snap switches with Vulcabeston Commutators, 15 A. 250 V. Cat. Nos. 2025, 2026, 2045, 2046. Approved Feb. 13, 1909. Manufactured by

Perkins Electric Switch Mfg. Co., Bridgeport, Conn.

TRANSFORMERS.

Electrolytic rectifier. A device consisting of a small transformer, a pair of aluminum cells and two storage cells with necessary connections and terminals, all enclosed in a substantial iron cylinder with grated cover. Primary of transformer to be connected by means of approved reinforced flexible cord and attachment plug to 125 volt A. C. circuit. Through the action of transformer and aluminum cells the storage cells are charged and from them a four volt D. C. current may be taken for operating an electrically driven piano-player or other suitable device. Approved Feb. 20, 1909. Manufactured by

Electrelle Company, 1011 Diamond St., Philadelphia, Pa.

WIRES, RUBBER-COVERED.

Marking: Red and black threads parallel with wire between rubber insulation and braid. Approved Feb. 17, 1909. Manufactured by

Electric Cable Co., Bridgeport, Conn.

NEWS NOTES

FINANCIAL.

PASADENA, CAL.—Bonds have been issued here to the amount of $150,000 for extending the lighting facilities.

EL CENTRO, CAL.—The city Trustees propose issuing bonds to the amount of $50,000 for installing a domestic water system here.

SIERRA MADRE, CAL.—An ordinance has been introduced by the Trustees of this city calling for the sale of $30,000 in bonds for a municipal gas plant.

GLOBE, ARIZ.—The City Council proposes issuing bonds, which are to be sold to Ulen & Sutherlin, of Kansas City, to the amount of $275,000, for building a municipal water plant here.

SAN FRANCISCO, CAL.—The Pacific Telephone & Telegraph Company's bonds to the amount of $15,000,000, being part of the $35,000,000 issue authorized in 1907, have been bought by J. P. Morgan & Co., of New York. Henry T. Scott, of the Pacific Telephone & Telegraph Company, says: "The money will be used to improve the service on the Pacific Coast. It is the intention of the company to extend its lines and to install at least 50,000 new telephones this year."

SAN FRANCISCO, CAL.—The earnings of the United Railroads for the year 1908 show a substantial increase over those of 1907. The gross earnings for the year 1908 are given as $6,866,303, and for 1907 as $4,745,116, showing an increase of nearly 50 per cent. The net earnings for 1908 are given as $2,623,553, and for 1907 as $1,305,517, showing an increase of more than 100 per cent. The monthly earnings show a continual increase. In November, 1908, the gross earnings were $574,422, against $449,732 for the same month in 1907; December, 1908, the net earnings were $260,332, against $134,522 for the same month in 1907.

SAN FRANCISCO, CAL.—The annual report of the Associated Oil Company shows the company's earnings for 1908 to be $2,237,236.91 and the net gain $1,521,520.74. The total sales of oil in 1908 exceeded those of 1907 by only 6 per cent, but the net realization per barrel was 30 per cent higher. During the past year there has been a marked increase in the selling price of oil, which was due largely to decrease in development work of all the producing companies throughout the State. The production at present is slightly greater than the consumption. During 1908 sixty-five new wells were completed and five old abandoned wells were put in action, making the production total 310, as against 240 at the close of 1907. The new wells opened were as follows: Kern River, 41; McKittrick, 15, and Coalinga 9. The total production increased about 52 per cent, while the cost of production was about 10 per cent less. The Associated Pipe Line Company, a sub-company of the Associated Oil, completed, during the year, 282.7 miles of eight-inch riffed pipe line from Bakersfield to Port Costa. The Associated Transportation Company, of which the Associated is the largest stockholder, finished during the year the Santa Maria-Gaviota line of 30.53 miles. Two storage stations have been completed, one at San Francisco, capable of holding 85,000 barrels, and the other at Redondo, capable of holding 66,000 barrels. Also tonnage for 241,700 barrels at Port Costa, the terminus of the riffed pipe line, has been established.

INCORPORATIONS.

SAN FRANCISCO, CAL.—The Red Wing Oil Company has been incorporated here with a capital stock of $500,000 by J. S. Corrigan, H. F. Clarrage, M. J. Jordan, J. J. McKinzey and J. D. Bell.

PHOENIX, ARIZ.—The Coalinga-Alladin Oil Company has been incorporated here.

SAN BERNARDINO, CAL.—The Needles Light & Power Company has been incorporated here with a capital stock of $50,000 by W. B. Palmer, W. W. Perry and M. P. Thye.

SAN LUIS OBISPO, CAL.—The Crown Oil Company has been incorporated here with a capital stock of $500,000 by R. A. Wickenden, F. J. McHenry, A. C. Shuster, J. F. Godwin and G. P. Merritt.

LOS ANGELES, CAL.—The Arizona Petroleum Company has been incorporated here with a capital stock of $250,000 by W. T. Brown, J. A. Brown, A. Adams, W. M. Cloypool and A. J. Pickrel.

RHYOLITE, NEV.—A company known as the Pioneer Water Company is to be formed here with a capital stock of $300,000. The incorporators are B. L. Smith, J. J. Owens and Len P. McGarry. The company proposes to build a pumping station and reservoir at Crystal Springs and install a pipe line to this city.

SAN FRANCISCO, CAL.—The California Electric Generating Company, recently organized for the purpose of erecting an electric steam-generating plant in Oakland, has issued a statement showing its working plans. The company's plant will be leased to the Great Western Power Company, and will be operated in connection with the Great Western power plant on the Feather river, in Butte county. The capitalization of the company is:

Stock.	Authorized.	Issued.
Six per cent authorized	$2,500,000	$600,000
Common	5,000,000	5,000,000

The power house is to be built of steel and masonry and will have a capacity of about 13,500 horsepower. The building is to be so constructed that at any time additions can be made with but little expense.

ILLUMINATION.

ONTARIO, CAL.—The Ontario Upland Gas Company has procured a franchise to lay thirty miles of pipe line from this city.

SAN DIEGO, CAL.—The City Council is now considering plans and specifications for the proposed ornamental lighting of Fifth street.

LOS ANGELES, CAL.—The City Council proposes installing ornamental lights on Main street, between Marchessault and Pico streets.

UPLAND, CAL.—Work has commenced on the installing of a modern gas plant at Ontario and service will be soon extended to this city.

EUGENE, ORE.—The Eugene Light & Power Company has been organized to develop 2,000 horse power on the McKenzie river. F. L. Chambers, of Eugene, is interested.

VALLEJO, CAL.—The Pacific Gas & Electric Company plans to spend a large sum purchasing new machinery and making extensive improvements at the local water works.

COALINGA, CAL.—Following the application of A. W. Smith and S. H. Hain for a gas franchise, the Trustees have advertised for and will receive bids up till April 1st for such a franchise.

REDLANDS, CAL.—The Edison Electric Company and the Home Gas & Electric Company have combined their interests here and have arranged that the gas and electric lines

will be handled by each company separately. The Edison Electric Company is to handle the electric business and the Home Company will take over the gas management.

TRANSMISSION.

OROVILLE, CAL.—S. B. Crane and Earl Talbot propose to build an electric power plant in Butte county.

AGNEWS, CAL.—Bids for furnishing and installing conduit and electric wiring for the State Hospital will be received by the board of managers until 7 p. m., April 7th.

CHICO, CAL.—The Board of City Trustees will receive bids for the sale of franchise right to erect poles and wires for the transmission and sale of electric power in this city on April 2d. Frank C. Wilson, of the Sierra Power Company, is the petitioner.

OROVILLE, CAL.—H. O. Lague has appropriated 25,000 inches of water from the Middle and North Forks on Nelson creek, in Plumas county. Mr. Lague has agreed with two Reno men, S. B. Crane and E. Talbot, to sell water for generating electricity at $2.50 for every horsepower generated.

CHICO, CAL.—The Oro Light & Water Company is now engaged in repairing the temporary barrier which was constructed to fill the break in the Miocene ditch dam on the west branch of the Feather river. The company plans this summer to install a concrete dam.

RED BLUFF, CAL.—Application for two water rights, both for 10,000 inches of water from Mill creek, have been received here. C. E. Burris proposes to divert the water into a flume seven feet wide and four feet deep, and carry the water along the right bank of the creek to a point where he is to erect an electric power plant. A. T. Forward proposes to use the water for power purposes also.

OIL.

MENDOTA, CAL.—The corps of United States Geological surveyors has traced the oil formation as far as Little Pinoche and have returned to Sacramento until a further appropriation is allowed for their work.

LOS ANGELES, CAL.—The oil producers of Southern California have sent a message to Senators Flint and Perkins and Representatives McLachlan and Smith, urging them to oppose any revision which might be made in the oil tariff.

FRESNO, CAL.—The Southern Pacific Railroad Company and its subsidiary organization known as the Kern Trading & Oil Company, have been sued by Edmund Burke to quiet title to certain sections which he claims as a placer mining claim.

BAKERSFIELD, CAL.—At a meeting of the stockholders of the Eldorado Oil Company directors were elected as follows: President, W. J. Berry; secretary-treasurer and general manager, W. I. Roberts; T. M. Young, Charles Beckerdike, C. E. Baer, E. L. Keller and F. C. Berrg. Work will begin about April 1st on the new 10-acre lease which has been secured on the West Side, in the Kern River field.

MIDWAY, CAL.—The water question, which was the main topic in this vicinity a few months ago, has about been solved. The Santa Fe has completed its six-inch line from the Little Santa Maria Valley, above McKittrick, down through the Midway field. This line was installed at a cost of approximately $100,000. The present three-inch line is to remain for use in emergencies. By the Southern Pacific Company sending out water from Kern City, some 14 or 15 companies have availed themselves of this opportunity, and the Stratton water system is able to give better service to its customers. This company is now engaged in drilling another well, and contemplated laying an auxiliary line throughout the territory its pipes now cover.

TRANSPORTATION.

WALLA WALLA, Wash.—The Columbia & Walla Walla Valley Traction Company has started construction here.

SAN MATEO, CAL.—Frank H. Ames and W. H. Obear, of Los Angeles, have applied for an electric street car franchise here.

SAN JOSE, CAL.—The San Jose Traction Company has petitioned for a franchise to standardize the lines now owned by the San Jose Railroad Company.

HOOD RIVER, ORE.—The Valley Electric Railway Company has been organized, with E. T. Folts as president, to build a road into the Hood River country.

PHOENIX, ARIZ.—G. M. Halm, F. J. Bennett, B. A. Fowler, J. W. Dorris and C. A. King are interested in the Suburban Railroad Company, which plans an electric railway within the city limits.

SAN FRANCISCO, CAL.—At a mass meeting of the citizens of Bernal Heights district it was agreed to accept the offer of the United Railroad Company to furnish $15,000 of the $28,000 which is required to build a car line from Mission to Folsom streets.

LOS ANGELES, CAL.—A right of way through the Pasadena Cemetery, claimed by the Los Angeles & Pasadena Electric Railway Company, the Pacific Electric Railway Company, and others, is sought to be condemned by the Pasadena Cemetery Association in a suit filed in the Superior Court this week.

WATER.

CORNING, CAL.—John Simpson contemplates an early rehabilitation of his water works.

OCEANSIDE, CAL.—The Pacific Light & Power Company has plans for a reservoir at Warner ranch to cost $551,000.

WATSONVILLE, CAL.—Bids will be received up till April 9th for the construction of a complete water system in this city.

VALLEJO, CAL. — Captain J. Gorham Nevins and B. Wiseman are planning to erect a salt water pumping plant to supply water for a bath house.

YUBA CITY, CAL.—Bids have been received by the City Clerk for the necessary equipment in the construction of a municipal water works for this city.

PETALUMA, CAL.—Bids for furnishing and installing pumping machinery for a salt water high pressure system will be received by the City Clerk until May 5th.

BLACK DIAMOND, CAL.—The Black Diamond Water Company is making some extensive improvements to its plant. A large gasoline engine is to be installed shortly.

SACRAMENTO, CAL.—Plans are now being made with Professor Charles Gilbert Hyde, of the University of California, for the preparation of a municipal filtration plant.

TELEPHONE AND TELEGRAPH.

BERKELEY, CAL.—The Pacific States Telephone & Telegraph Company has about completed a number of improvements in this city which will cost upwards of $75,000.

SAN FRANCISCO, CAL.—The Postal Telephone & Telegraph Company, which recently took over the Nevada Telephone & Telegraph Company, has asked for a franchise to construct a telephone and telegraph line from Reno to Ely, via Carson City, Dayton, North Churchill, Goldfield and Tonopah. This company already has offices in Goldfield, Ely, Tonopah and Carson City, and as soon as the franchise is secured will begin building its line into Reno, where an office will be established.